

# ISS*Live!* A Rich Internet Application Development for International Space Station Educational Outreach

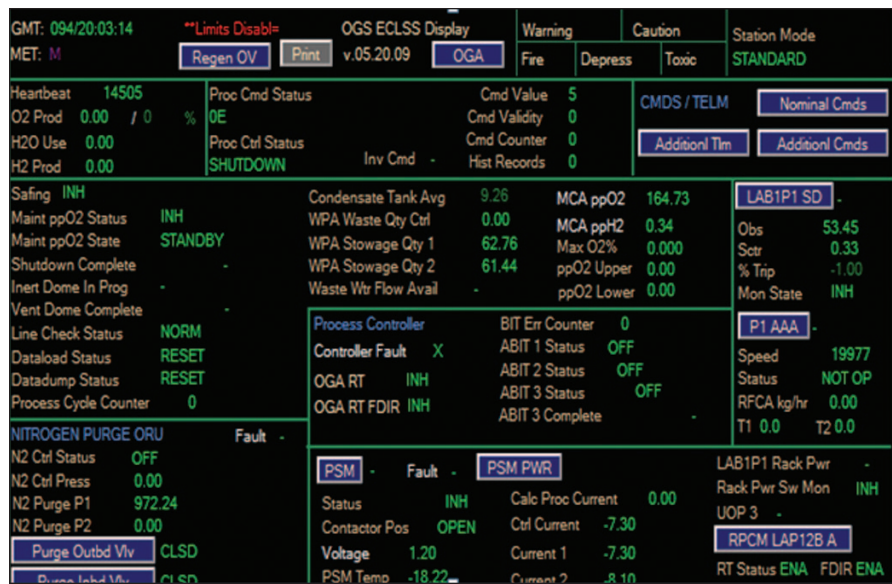
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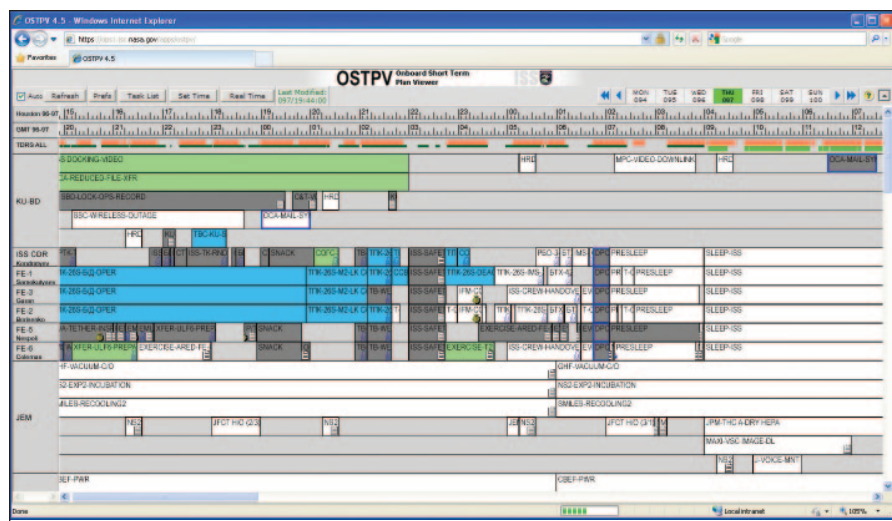
## Safely and Securely Putting Informative, Live Internal International Space Station Data for Use on the Web

The International Space Station (ISS) uses numerous internal computer networks to handle downlinked telemetry, operational timelines and procedures, and activities in day-to-day operations on the ground and for the onboard crew. The ISS and its control centers around the globe use a web-based intranet to handle some of this important, non-critical mission data in a read-only format. In addition, web-based software links to Mission Control Information Sharing Protocol Servers allow for some select mission control telemetry data to be made available in a viewable format, identical to existing flight controller displays inside the Mission Control Center. This existing system, which lets external users access displays on the web, is part of the Mission Control Center Data Portal System and uses a Java-based web technology called MSKWin.

To advance this technology further, a new “push” technology server was added to this network. This server, which uses a .NET interface and Asynchronous JavaScript, and XML streaming called “Lightstreamer,” will allow for continuous lightweight streaming of telemetry data in a web-friendly JavaScript/html form. This allows for configurable and lightweight MSKWin-type displays (figure 1) to be generated on the web without having to use any heavy client-dependant plug-ins or Java applets. This technology makes these displays and telemetry portable enough for use on mobile devices and smartphones like the Apple iPad and iPhone, and on Google Android devices.



**Fig 1.** MSKWin web view of a sample International Space Station Environmental Telemetry Display.



**Fig 2.** Onboard Short-Term Plan Viewer timeline viewer.

In addition, the Mission Control Center Web Tools team and Johnson Space Center's (JSC's) Mission Operations Directorate's Flight Planning Branch currently produce a web-based crew timeline called the Onboard Short-Term Plan Viewer (OSTPV) (figure 2). This JSC award-winning software is a "*TV Guide-like*" view of daily activities used

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by both the ground and the crew in day-to-day operations of the station. Every event that goes on, related to any Mission Control Center or onboard the station, is scheduled and viewable on this web-based viewer. As such, OSTPV is a vital, internal situational awareness resource for the ISS community and onboard the station.

### ISSLive!: International Space Station Mission Control in Your Pocket

ISSLive! is a software suite that combines and uses the availability of these two internal data sources through web services and a dedicated external server, into a new, public-friendly web content delivery source for NASA ISS Educational Outreach (figure 3).

ISSLive! will include websites and mobile applications that tie ISS telemetry and operational timelines into one “Rich Internet Application” experience, made public off of the NASA portal ([www.nasa.gov](http://www.nasa.gov)) as well as on commercial “app” stores such as the Apple App store (see ISSLive! prototype views: iPad in figure 4; and iPhone in figure 5). The applications will offer data on real-time parameters such as station position, internal environment, altitude, payload rack science activities, and other interesting data and crew activities. ISSLive! will tie this data into an interactive application that will include the latest social media feeds relevant to the ISS, including astronaut Twitter feeds, image of the day, and real-time mission video.

ISSLive! will contain a scrollable timeline with a “public-friendly” view of crew and payload activities. As a website, it will use some of the latest interactive web content technologies, including creating three-dimensional interactive virtual views of the Mission Control Center and ISS. The intention is to have ISSLive! be a “one-stop shop” for ISS data, letting users in on the fascinating activities that happen daily onboard the ISS.

Working in conjunction with the NASA Education Office, ISSLive! content will serve as the basis for development of interactive lessons in the science, technology, engineering, and math fields. ISSLive! will also be a resource for the space enthusiast and the life-long learner to participate in the mission of the ISS.

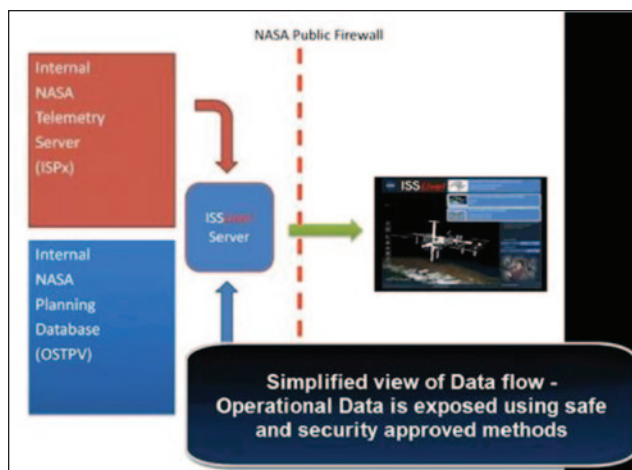


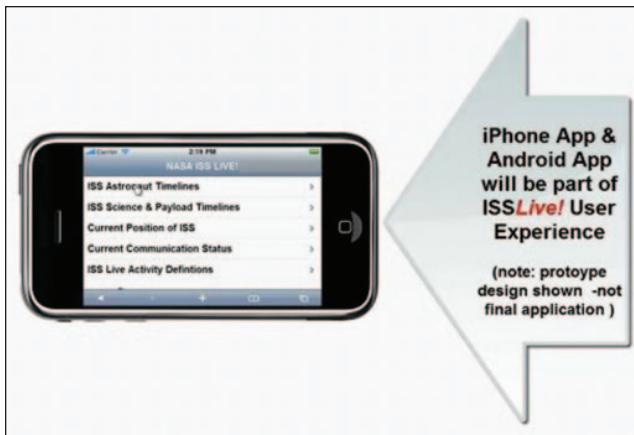
Fig 3. ISSLive! simplified dataflow architecture.



Fig 4. iPad interactive view of ISSLive! (prototype).

### ISSLive!: A Mobile and Interaction Design Challenge

ISSLive! developers are currently partnering with Human Computer Interface Design Students at top-ranked Carnegie Mellon University to create application prototypes and interfaces to display ISSLive! data for the public. ISSLive! will also include an activity translator (also see the article titled “ISSLive! Translator: From NASA Operations Nomenclature to Every Day Language,” in this Johnson Space Center Biennial Research and



**Fig 5.** Smartphone view of ISSLive! (prototype).

Technology Development Report 2011). ISSLive! will further make an application programming interface available as a web service for external developers to take ISS data and put those data into their own websites and mobile applications.

### **ISSLive!: In Summary**

Working with mission control operators, educators, and developers, ISSLive! will strive to develop innovative user interface designs and implement them in code to provide a Rich Internet Application experience for overall ISS educational outreach. ISSLive! has been deployed to the NASA portal ([www.nasa.gov](http://www.nasa.gov)).